Montana Comprehensive Assessment System

Mathematics

Grade level learning expectations for Grades 3, 4, 5, 6, 7, 8, 10 and Upon Graduation

Prepared by the Office of Public Instruction * Linda McCulloch, Superintendent * 2003
OPI Web site: www.opi.mt.gov
Questions Contact: Linda Vrooman Peterson (406) 444-5726 or lvpeterson@mt.gov

Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 10	Upon Graduation
Advanced a) demonstrates emerging self-motivation and independence as a learner;	Advanced a) demonstrates self-motivation and emerging independence as a learner;	Advanced a) demonstrates self-motivation and increasing independence as a learner;	Advanced a) demonstrates self-motivation and increasing independence as a learner;	Advanced a) demonstrates self-motivation and independence as a learner;	Advanced a) demonstrates self-motivation and independence as a learner;	Advanced a) demonstrates self-motivation, independent as a learner, and extends and connects ideas;	Advanced a) demonstrates self-motivation, independent as a learner, and extends and connects ideas;
b) accurately selects among several problem-solving strategies and uses them effectively;	b) accurately selects and uses problem solving strategies;	b) accurately selects and effectively uses appropriate problem-solving strategies	b) accurately selects and effectively uses appropriate strategies in a variety of problems;	b) accurately and effectively applies appropriate strategies in problem-solving and new situations;	b) is accurate and fluent when applying mathematical processes; and technologies to solve a variety of problems;	b) is accurate, fluent and articulate when applying mathematical processes and technologies to solve a variety of problems;	b) is accurate, articulate, and effective when applying mathematical processes, and appropriate technologies to solve real and theoretical problems;
c) clearly and effectively communicates solutions to problems;	c) presents well-organized solutions and communicates in ways that exceed requirements;	c) presents well-organized solutions and communicates in ways that exceed requirements;	c) clearly and effectively communicates organized solutions as well as multiple approaches to problems;	c) effectively defends the correctness of solutions to problems including presentation of multiple approaches;	c) effectively uses multiple strategies, extends concepts to new situations; and communicates results;	c) effectively uses multiple strategies, extends concepts to new situations, formulates logical arguments and communicates results;	c) effectively uses multiple strategies, extends concepts to new situations, skillfully communicates the results;

d) uses whole numbers to add, subtract, and estimate accurately and fluently;	d) uses whole numbers accurately and fluently to estimate, compute, and determine whether results are accurate and reasonable;	d) uses all four operations on whole numbers, as well as addition and subtraction of decimals, accurately and fluently to estimate, compute, and determine whether results are accurate and reasonable;	d) uses all four operations on whole numbers, decimals, and fractions accurately and fluently to estimate, compute, and determine whether results are accurate and reasonable;	d) applies rational numbers, proportions, and percents accurately and fluently to solve real and mathematical problems;	d) explores hypothetical questions, articulates valid arguments and applies and extends rational numbers and proportionality;	d) explores hypothetical questions, articulates valid arguments, and constructs proofs;	d) explores hypothetical questions, uses complex reasoning to articulate valid arguments, and constructs proofs;
e) writes number sentences to represent simple real addition or subtraction situations and solves the number sentences;	e) effectively applies basic algebraic concepts and clearly communicates representations in a variety of ways;	e) effectively applies basic algebraic concepts and represents relationships in various ways including expressions/equations, charts, and tables;	e) effectively uses basic algebraic concepts and represents relationships in ways appropriate to solving problems;	e) uses basic algebraic concepts to generate multiple representations of real-world problems and uses appropriate representations to solve problems;	e) consistently applies algebraic concepts to represent and solve real and theoretical problems;	e) consistently applies functions, graphs, and algebraic concepts to solve real and theoretical problems;	e) skillfully and accurately applies functions, graphs, and algebraic concepts to solve real and theoretical problems;
f) identifies and clearly describes relationships among types of two- and three-dimensional shapes;	f) examines relationships of shapes in the physical world and makes generalizations;	f) examines relationships among shapes in the physical world and makes generalizations;	f) accurately applies geometric relationships such as congruence and symmetry and makes generalizations;	f) accurately applies geometric relationships such as congruence and similarity and makes generalizations;	f) applies complex geometric relationships to hypothetical situations;	f) applies complex geometric and algebraic relationships to model hypothetical situations;	f) applies complex measurement and geometric and algebraic relationships to model a variety of problems and situations;

g) selects and accurately uses appropriate tools for measurement;	g) selects and accurately uses appropriate tools for measurement;	g) selects appropriate units for measurement, relative to the purpose of the measurement, including square and cubic units;	g) accurately performs conversions between units of area and volume;	g) predicts from the formulas how a change in one dimension of a figure will change it's area or volume;	g) applies complex measurement to hypothetical situations and problems;	g) applies complex measurement to model hypothetical situations and problems;	g) applies complex measurement to model a variety of problems and situations;
h) makes accurate predictions and inferences based on data; and	h) accurately predicts and makes reasonable decisions based on data; and	h) accurately predicts and makes reasonable decisions based on data, and	h) makes accurate predictions and decisions based on data, basic probability, and statistics; and	h) makes accurate predications and decisions based on data, basic probability, and statistics; and	h) consistently makes accurate predictions and decisions based on basic probability and statistics; and	h) consistently makes accurate and reasonable predictions and decisions based on data, probability, and statistics; and	h) designs statistical experiments and makes accurate and reasonable predictions and decisions based on data, probability, and statistics to solve real and theoretical problems; and
i) analyzes a variety of patterns, accurately identifies next terms in the patterns, and clearly describes their rules.	i) articulately and fluently communicates representations, analyzes patterns, and clearly describes relationships, and applies them to varied situations.	i) analyzes a wide variety of patterns, accurately extends the patterns, and clearly describes their rules.	i) analyzes mathematical and real life patterns and describes them using graphical, numerical, algebraic, and verbal representations.	i) effectively uses multiple representations including tables, graphs, and algebraic equations to investigate patterns and functions.	i) effectively analyzes and describes functional relationships and patterns and their representations.	i) effectively and accurately analyzes functions and using graphical, numerical and algebraic methods.	i) consistently and accurately analyze functions and patterns using graphical, numerical, and algebraic methods and select the appropriate function to model real world phenomena.

Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 10	Upon Graduation
Proficient a) selects among several problem-solving strategies and technologies and applies them accurately;	Proficient a) selects and uses appropriate problem-solving strategies and technologies;	Proficient a) selects and uses appropriate problem-solving strategies and technologies;	Proficient a) selects and uses appropriate strategies and technologies in a variety of problems	Proficient a) applies appropriate strategies and technologies in a variety of problems;	Proficient a) selects and applies mathematical processes and technologies correctly to solve a variety of problems;	Proficient a) applies mathematical processes and technologies correctly to solve a variety of problems and communicates the results;	Proficient a) applies mathematical processes and technologies correctly to solve a variety of problems and communicates the results;
b) communicates solutions to problems;	b) communicates organized solutions to problems;	b) communicates organized solutions to problems;	b) communicates organized solutions to problems and provides appropriate support;	b) communicates organized solutions to problems and provides appropriate support;	b) formulates and communicates logical arguments using appropriate mathematical ideas;	b) uses reasoning to formulate and communicate logical arguments;	b) uses reasoning to formulate and communicate logical arguments and proofs;
c) uses whole numbers to add, subtract, multiply, and make estimates;	c) uses all four operations of whole numbers to estimate, compute, and determine whether results are accurate;	c) uses all four operations of whole numbers, as well as addition and subtraction of decimals, to estimate, compute, and determine whether results are accurate and reasonable;	c) uses all four operations of whole numbers, decimals, and fractions to estimate and compute, and to determine whether results are accurate and reasonable;	c) uses rational numbers, proportions, and percents to solve problems;	c) uses rational numbers and proportionality to represent and accurately solve problems;	c) uses real and complex number systems to solve mathematical problems;	c) uses real and complex number systems to solve mathematical problems;

d) selects and solves number sentences that represent simple real-world addition or subtraction situations;	d) applies basic algebra concepts using concrete and symbolic representations and communicates relationships in a variety of ways;	d) applies basic algebraic concepts and communicates different representations of the same relationship;	d) uses basic algebraic concepts and represents relationships in appropriate ways to solve selected problems;	d) uses basic algebraic concepts to generate appropriate relationships to solve real-world problems;	d) uses algebraic concepts and methods to represent and solve real-world problems;	d) applies functions, graphs, and algebraic concepts to solve real-world problems;	d) applies functions, graphs, and algebraic concepts to solve real and theoretical problems;
e) identifies two- and three-dimensional shapes	e)identifies and accurately uses relationships among shapes in the physical world;	e) identifies and accurately uses relationships among shapes in the physical world;	e) applies geometric relationships to solve selected problems;	e) applies geometric relationships such as coordinates and transformations to solve selected problems;	e) geometric relationships and properties to solve real-world problems;	e) applies geometric relationships properties to model a variety of problems and situations;	e) applies geometric and algebraic relationships to model a variety of problems and situations;
f) determines measurable attributes of objects and selects appropriate tools for measurement;	f) determines measurable attributes of objects and selects appropriate tools for measurement;	f) selects appropriate units for measurements, including square and cubic units;	f) performs conversions among basic units within a system of measurement and determines the areas of geometric figures;	f) uses formulas to determine areas and volumes;	f) uses complex measurement to describe the physical world and solve real-world problems;	f) applies complex measurement to describe and compare and contrast objects in the physical world and solve real-world problems;	f) applies complex measurement and appropriately analyzes error of measurement, precision, and accuracy;

g) draws appropriate conclusions based on data; and	g) predicts and makes appropriate decisions based on data; and	g) predicts and makes appropriate decisions based on data; and	g) makes reasonable predictions and decisions based on data, basic probability, and statistics; and	g) makes reasonable predictions and decisions based on data, probability, and statistics; and	g) makes reasonable predictions and decisions based on data, basic probability, and statistics; and	g) makes reasonable predictions and decisions based on data, probability, and statistics: and	g) designs simple statistical experiments selecting appropriate samples and makes reasonable predictions and decisions based on data, probability, and statistics: and
h) identifies a variety of patterns and the next term in the patterns.	h) uses a variety of patterns to describe real-world relationships.	h) analyzes a variety of patterns, and represents their relationships in various ways.	h) analyzes a variety of patterns, and represents their relationships in various ways.	h) analyzes and describes patterns and functions using various representations.	h) analyzes and describes functional relationships and their representations.	h) analyze functions using graphical, numerical, and algebraic methods.	h) analyzes functions using graphical, numerical, and algebraic methods and select the appropriate function to model real world phenomena.

Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 10	Upon Graduation
Nearing Proficiency a) sometimes uses appropriate problem-solving strategies and technologies;	Nearing Proficiency a) sometimes selects and uses appropriate problem-solving strategies and technologies;	Nearing Proficiency a) sometimes selects and uses appropriate problem-solving strategies and technologies;	Nearing Proficiency a) sometimes selects and uses appropriate strategies and technologies to solve problems	Nearing Proficiency a) sometimes applies appropriate strategies and technologies to solve problems;	Nearing Proficiency a) applies mathematical processes and technologies correctly to solve problems;	Nearing Proficiency a) applies mathematical processes and technologies correctly to solve problems and sometimes communicates the results;	Nearing Proficiency a) applies mathematical processes and technologies correctly to solve problems and sometimes communicates the results;
b) sometimes communicates solutions to problems;	b) sometimes communicates organized solutions to problems;	b) sometimes communicates organized solutions to problems;	b) sometimes communicates organized solutions to problems with limited support;	b) sometimes communicates organized solutions to problems with limited support;	b) formulates and communicates arguments occasionally using appropriate mathematical ideas;	b) uses reasoning to formulate arguments and with assistance solves simple proofs;	b) uses reasoning to formulate arguments and with assistance solves simple proofs;
c) uses whole numbers to add, subtract, multiply and make estimates with generally reasonable results;	c) uses all four operations with whole numbers to estimate and compute with generally reasonable results;	c) uses all four operations with whole numbers, as well as addition and subtraction of decimals, to estimate and compute with generally reasonable results;	c) uses all four operations of whole numbers, decimals, and fractions to estimate and compute, with occasional errors, particularly with decimals and fractions;	c) uses rational numbers, proportions, and percents to solve problems, with occasional errors;	c) uses rational numbers and proportionality to represent and solve problems, with occasional errors;	c) uses real and complex number systems to solve mathematical problems with occasional errors;	c) uses real and complex number systems to solve mathematical problems with occasional errors;

d) sometimes recognizes and solves number sentences that represent simple real-world addition or subtraction situations;	d) sometimes applies basic algebraic concepts using concrete and symbolic representations and communicates relationships;	d) sometimes applies basic algebraic concepts and communicates different representations of the same relationship;	d) sometimes uses basic algebraic concepts and represents relationships to solve simple problems;	d) sometimes uses basic algebraic concepts to generate appropriate relationships to solve real-world problems;	d) sometimes uses algebraic relationships to solve real-world problems;	d) sometimes applies functions, graphs, and algebraic concepts to solve real-world and theoretical problems;	d) sometimes applies functions, graphs, and algebraic concepts to solve real-world and theoretical problems;
e) identifies two- and three-dimensional shapes, but with occasional errors;	e) sometimes identifies and uses relationships among shapes in the physical world;	e) sometimes identifies and uses basic relationships among shapes in the physical world;	e) sometimes applies geometric relationships to solve simple problems;	e) sometimes applies geometric relationships, such as coordinates and transformations, to solve simple problems;	e) sometimes uses geometric relationships to solve real-world problems;	e) sometimes applies geometric and algebraic relationships to model a variety of problems and situations;	e) sometimes applies geometric and algebraic relationships to model a variety of problems and situations;
f) determines measurable attributes of objects, but does not always select appropriate tools for measurement;	f) determines measurable attributes of objects, but does not always select appropriate tools for measurement;	f) sometimes selects appropriate units for measurement including square and cubic units;	f) performs conversions among basic units within a system of measurement and sometimes determines the areas of geometric figures, with occasional errors;	f) uses formulas to determine areas and volumes with occasional errors;	f) uses measurement to describe the physical world and solve real-world problems, with occasional errors;	f) sometimes applies complex measurement and analyzes error of measurement, precision, and accuracy;	f) sometimes applies complex measurement and analyzes error of measurement, precision, and accuracy;

g) reads data from simple graphs and charts and sometimes draws appropriate conclusions; and	g) sometimes predicts and makes appropriate decisions based on data; and	g) sometimes predicts and makes appropriate decisions based on data; and	g) sometimes makes reasonable predictions and decisions based on data, basic probability, and statistics; and	g) makes reasonable predictions and decisions based on data, probability, and statistics with occasional errors; and	g) makes reasonable predictions and decisions based on data, probability, and statistics, with occasional errors; and	g) sometimes makes predictions and decisions based on data, probability, and statistics, with occasional errors; and	g) designs simple statistical experiments selecting appropriate samples and makes predictions and decisions based on data, probability, and statistics, with occasional errors; and
h) identifies simple patterns and sometimes identifies the next term.	h) uses a limited range of patterns, and sometimes describes relationships within those patterns.	h) analyzes a limited variety of patterns and represents their relationships.	h) analyzes a limited variety of patterns and represents their relationships.	h) analyzes and describes patterns and functions using limited representations.	h) analyzes and describes simple patterns and functional relationships using limited representations.	h) analyzes and describes simple patterns and functional relationships, using limited graphical, numerical, and algebraic methods.	h) analyzes patterns and functions using graphical, numerical, and algebraic methods and sometimes selects the appropriate function to model real-world phenomena.

Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 10	Upon Graduation
Novice a) uses only a few problem-solving strategies and technologies correctly;	Novice a) sometimes selects and uses only a few problem-solving strategies and technologies;	Novice a) sometimes selects and uses only a few problem-solving strategies and technologies;	Novice a) demonstrates use of only a few problem-solving strategies and technologies, often implementing them incompletely or incorrectly;	Novice a) frequently applies incomplete or incorrect strategies and technologies for problem solving;	Novice a) selects and applies only a few mathematical processes and technologies problem solving;	Novice a) demonstrates limited and incomplete use of mathematical processes and problem-solving strategies;	Novice a) demonstrates limited and incomplete use of mathematical processes and problem-solving strategies;
b) often communicates only limited information regarding solutions to problems;	b) communicates poorly organized solutions;	b) communicates poorly organized solutions;	b) often communicates incomplete or confused descriptions of solutions;	b) often communicates incomplete or confused descriptions of solutions;	b) often formulates and communicates incomplete arguments using appropriate mathematical ideas;	b) often uses limited and incomplete reasoning to formulate arguments and communicate mathematical ideas;	b) often uses limited and incomplete reasoning to formulate logical arguments and communicate mathematical ideas;
c) uses whole numbers to add, subtract, multiply and make estimates, but is frequently inaccurate;	c) uses all four operations with whole numbers to estimate and compute, but is frequently inaccurate;	c) uses all four operations with whole numbers, as well as addition and subtraction of decimals, to estimate and compute but is frequently inaccurate;	c) uses all four operations with whole numbers, decimals, and fractions to estimate and compute with frequent errors particularly with decimals and fractions;	c) uses rational numbers, proportions, and percents, with frequent errors;	c) uses rational numbers and proportionality to represent and solve problems, often with errors;	c) makes only concrete, mathematical connections;	c) makes only concrete, mathematical connections;

d) solves some simple number sentences, but has difficulty associating number sentences with real situations;	d) demonstrates some algebraic understanding of concrete and symbolic representations, but often misconceptions are present;	d) demonstrates some understanding of basic algebraic concepts, but often has difficulty explaining or generalizing;	d) uses basic algebraic concepts to represent simple problems, but often with conceptual errors;	d) sometimes uses basic algebraic concepts to represent simple real-world problems, but has difficulty using representations to solve problems;	d) sometimes uses basic algebraic concepts, methods, and simple representations to solve simple real-world problem;	d) sometimes applies algebraic concepts and methods, functions, and graphs to solve real-world problems;	d) sometimes applies algebraic concepts and methods functions, graphs, and to solve real-world problems;
e) identifies few two- and three-dimensional shapes;	e) identifies, models, and classifies some shapes with limited understanding of their relationships;	e) identifies some basic relationships among shapes in the physical world;	e) identifies simple examples of geometric relationships such as congruence and symmetry;	e) applies geometric relationships, such as coordinates and transformations, often incorrectly, when attempting to solve simple problems;	e) applies geometric relationships and properties, often incorrectly, to solve simple real-world problems;	e) applies geometric relationships and properties, often incorrectly, to solve simple real-world problems;	e) applies geometric relationships and properties, often incorrectly, to solve real-world problems;
f) determines some measurable attributes of objects, but often does not select appropriate tools for those measurements;	f) determines some measurable attributes of objects, but often does not select appropriate tools for measurement;	f) determines the type of measurement required but often does not select the appropriate units;	f) performs only simple conversions among basic units within a system of measurement, and often incorrectly determines the areas of geometric figures;	f) uses formulas to determine areas and volumes with frequent errors;	f) uses basic measurement to describe the physical world and solve simple real-world problems, often with errors;	f) uses basic measurement to describe the physical world and solve simple real-world problems, often with errors;	f) uses basic measurement to describe the physical world and solve simple real-world problems;

g) reads data from simple graphs or charts, often incorrectly; and	g) sometimes predicts, but often makes inappropriate decisions based on data; and	g) often makes incorrect predictions and decisions based on data; and	g) often makes inaccurate predictions and decisions based on data, basic probability, and statistics; and	g) makes simple predictions and decisions based on data, basic probability, and statistics, often with errors; and	g) makes some predictions and decisions based on data, basic probability, and statistics, often with errors; and	g) makes some predictions and decisions based on data, but seldom recognizes statistical or probability concepts; and	g) makes some predictions and decisions based on data, but seldom recognizes statistical or probability concepts; and
h) sometimes identifies the next term in simple patterns, often inaccurately.	h) uses a limited range of patterns and inaccurately describes relationships within those patterns.	h) analyzes some simple patterns and sometimes represents their relationships	h) analyzes simple patterns and represents their relationships, often with errors.	h) analyzes simple patterns and functions and describes their relationships, often with errors.	h) analyzes simple patterns and functions and describes their relationships, often with errors.	h) analyzes and describes patterns and functional relationships and their representations, often with errors.	h) analyzes and describes patterns and functional relationships and their representations, often with errors.